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## Applications of the Finite Operator ${}_3\mathcal{E}_2 \left( \begin{matrix} q^{-N}, a, b \\ c, d \end{matrix}; q, -f\theta \right)$ for the Polynomials $B_n(a, b, c, d, f, x, y|q)$

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### Abstract

In this work, polynomials  $B_n(a, b, c, d, f, x, y|q)$  and the finite  $q$ -exponential operator  ${}_3\mathcal{E}_2$  are constructed. The operator  ${}_3\mathcal{E}_2$  is used to combine an operator proof of the generating function with its extension, Mehler's formula with its extension and Roger's formula for the polynomials  $B_n(a, b, c, d, f, x, y|q)$ . The generating function with its extension, Mehler's formula with its extension and Rogers formula for Al-Salam-Carlitz polynomials  $U_n(x, y, a; q)$  are deduced by giving special values to polynomials  $B_n(a, b, c, d, f, x, y|q)$ .

**Keywords:** Finite  $q$ -exponential operator, Generating function, Mehler's formula, Rogers formula, Al-Salam-Carlitz polynomials.

تطبيقات المؤثر المنتهي  ${}_3\mathcal{E}_2 \left( \begin{matrix} q^{-N}, a, b \\ c, d \end{matrix}; q, -f\theta \right)$  لمتعددات الحدود  $B_n(a, b, c, d, f, x, y|q)$

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### الخلاصة

نقوم ببناء متعددات الحدود  $B_n(a, b, c, d, f, x, y|q)$  بالإضافة إلى المؤثر الأسّي  $q$ -المنتهي  ${}_3\mathcal{E}_2$ . استخدمنا المؤثر  ${}_3\mathcal{E}_2$  لأعطاء برهان المؤثر للدالة المولدة وتوسيعها، صيغة ملر وتوسيعها وصيغة روجرز لمتعددات الحدود  $B_n(a, b, c, d, f, x, y|q)$ . استنتجنا الدالة المولدة وتوسيعها، صيغة ملر وتوسيعها، وصيغة روجرز لمتعددات حدود السلام - كارلتز  $U_n(x, y, a; q)$  بإعطاء قيم خاصة لمتعددات الحدود  $B_n(a, b, c, d, f, x, y|q)$ .

## 1. Introduction

In this paper, we use the conventional notations for basic hypergeometric series from [1], and we also suppose that  $|q| < 1$ .

Let  $a$  be a complex variable. The  $q$ -shifted factorial is described by the authors in [1] as follows:

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